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AUTHOR Byers, Donnie N.
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ABSTRACT

As part of an effort to begin offering a general chemistry course over the Internet, a project was undertaken at Kansas's Johnson County Community College to determine the possibilities of using a computer to incorporate the tools used in teaching organic chemistry. Using an interactive software package, original lectures were developed, with lecture content being placed on slides and textbook overheads scanned into electronic format. In each lecture, buttons were added that linked to other software programs providing related information. The integration of these elements into the computer created an environment that promoted discussion, freeing class time that had previously been spent on drawing structures of chemical models, and allowed the instructor to more readily ascertain the levels of student comprehension. This approach can be easily reproduced on the Internet, using the World Wide Web and Lotus Notes, or another groupware tool to disseminate class materials and facilitate communication with the professor. The Web can provide students with information, animation, and visual material that cannot be distributed in paper format in the classroom. Student reactions to the computer-based format were overwhelmingly positive. Although modifying a class for computer or Internet delivery is time-consuming and the Web is still an unstable environment, students tend to enjoy the class more and thus stay in class. (BCY)

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So Why Use Multimedia, the Internet, and Lotus Notes?

Donnie N. Byers

Johnson County Community College

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So Why Use Multimedia, the Internet and Lotus Notes?

Goals:
Johnson County Community College (JCCC) has a long-term goal of offering General Chemistry as a course over the Internet. The short-term goal is to explore the possibilities as to how to offer that course synchronously.

Literature:
The use of Multimedia in the classroom to teach chemistry is not new. The impact of its use is well documented in the literature. Smith and Stovall (1) report the enhanced learning from CD ROM and networked materials available to their students. Crouch and Holden (2) support the use of molecular modeling as a very useful tool in teaching chemistry to undergraduate students. Moore and Miller (3) have shown that the use of multimedia in the classroom "can significantly improve students attendance, retention, and learning." They go on to say that the future of education lies in the production of excellent multimedia materials for use in the classroom. I would like to suggest an extension to their conclusion and say that those materials will be used for distributed education as well.

The long time editor of the Journal of Chemical Education, J.J. Lagowski wrote, "Teaching is more than lecturing. Lecturing is not teaching nor can listening be equated to learning." (4) A great deal of research has shown that people learn in different modalities. Learners tend to be grouped into three classes: visual, auditory and kinesthetic. Visual learners like to see pictures, diagrams and symbols. Most college students are visual learners! Auditory learners like sounds and words. Kinesthetic learners like to feel, taste and smell. If the information is not presented in a format suited to that individual, the information tends to be missed. Stice did a study and found that college students retain 10% of what they read, 26% of what they hear , 30% of what they see, 50% of what they see and hear and 70% of what they say and 90% of what they say as they DO something. With this in mind, multimedia has a great potential to improve the learning that goes on in a classroom. (5)

Classroom Use of Multimedia:
As an instructor at JCCC, I have been involved in using technology in the classroom over the past five years. The first use of technology was the use of Hypercard for the lecture material. It was my experience that Hypercard had limitations, therefore other more sophisticated packages were explored such as Powerpoint, Persuasion, Special Delivery and Astound. Desiring even more powerful packages, I currently use Director and Authorware.

The study reported here involved using a computer as the medium to incorporate the many tools used in teaching organic chemistry . It is not a static project but continues to evolve and change each semester.

The ancillary materials (computer programs, molecular modeling, CD ROM, etc.) that are available to teach organic chemistry have been greatly improved in this age of multimedia. It enhances the students' learning to incorporate these materials as part of the daily classroom teaching.

Prior to this time, I incorporated the use of several different media. in my organic chemistry lectures. Overheads were shown on the overhead projector to deliver the main lecture content. Various computer programs also were used to illustrate a concept or show specific topics in animation. The chalkboard was also used. It began to feel like a three ring circus in the classroom.

The need to incorporate all of these different elements into one format became apparent and multimedia presentations seemed to be an appropriate avenue. Initially a purchased lecture package called "Ochem" was used. Since this package could be edited, efforts were made to incorporate it as the backbone of my lectures. The editing process was very time consuming and very difficult. Thus, the decision to create my own lecture materials for the classroom became an easy one.

Several interactive software packages were reviewed. The complexity of Director made it a difficult program to learn in a short period of time, and packages such as PowerPoint offered to little flexibility. Initially, Special Delivery and Astound contained the elements needed to create my classroom presentations. Today Authorware is the most adaptable software found, though, it too has it shortfalls.

The production process involved entering the lecture content on slides. The textbook overheads were scanned and placed in the presentations. Buttons were placed within the program to go out and run other software programs that enhanced the lecture. The end result was an integrated presentation of the various elements used to present the daily lectures.

The incorporation of all the organic chemistry lecture materials into one platform (the computer) has proven to be very successful. It created an environment which promoted discussion of the lecture material with the students. A large portion of class time which had previously been spent drawing structures of chemical molecules was now available for classroom discussion. This drawing process is a very time consuming activity that results in very little new learning once the student masters the drawing and naming of the compounds. With the use of multimedia presentations, large portions of class time are no longer spent writing and drawing. Class time is available for discussion and learning!

Since the presentations enable the instructor to face the class, the students' faces can be observed and levels of comprehension can be more easily ascertained. The teaching format becomes more of a dialogue with the students than a lecture. Time becomes available to run CD ROM programs covering topics which are difficult to comprehend. This format allows for easy incorporation of 3-D molecular modeling. The end result is that the classroom time is more efficiently used because the students have a greater opportunity to see, hear, comprehend and ask questions.

An additional benefit of this format, is that each student gets a copy of the presentation slides, therefore they spend less time taking notes. This provides them with more time for discussion during class time.

Internet ands Lotus Notes Use:

The World-Wide Web has opened up a whole new arena for the dissemination of information. All students have the opportunity to access information at any time from anywhere with the use of a computer and a modem. According to Seagren and Watwood (6), "most institutions still equate distance education with interactive television which is expensive to operate and still restricts individuals to time and place constraints." They go on to state that the students of today expect educational materials delivered to them at their convenience and at a reasonable cost. This is provided by internet and Lotus Notes. They emphasize that "distributed education is not distance education, because it is based on the creation of a learning dialogue between participants in collaborative learning groups - no matter the participants' location or time in which they choose to interact. The method is based on creating and sharing documents among a learning group." The learning environment is open 24 hours a day.

Via the internet, material that is handed out in class can be published for retrieval without restriction of time and place. The entire class syllabus, the lecture handouts, the daily lectures and

homework assignments can be posted. It is my belief that the internet should deliver more than handout information. The web should supply information, animation, and visual material that could not be handed out on a piece of paper. This is where the multimedia material and molecular modeling can be implemented. As Polyson wrote, "Think beyond the traditional classroom paradigm as you begin to create your on-line course material." (7) The legal issue here is that of Fair Use guidelines - we are only at the beginning of how to use information over the web!!! See Fair Use Guidelines General Session VIII CCUMC Proceedings - Fall 1996 (8).

We envision a complete course offered over the internet. Those courses which I am aware of being offered currently involve the use of videotapes for lectures; some groupware tool for dissemination of class materials and for interaction with the professor; and the students only come to campus for labs and test (i.e. Doris Kimbrough, Colorado University, Denver). Our course will be delivered in its entirety over the internet. This includes lectures, labs, quizzes, and tests.

The goal is to have many of the ancillary materials currently used in the classroom on a CD ROM disc that students will either buy or rent for the semester. This CD ROM will be linked to presentation materials via the internet. The use of the CD affords a faster mode of access to lengthy files for the student and will also limit the access of the entire course to casual passers-by on the internet.

On my home page, I have accumulated a set of links that are very helpful to my students. They contain many information links which help them access information which once had to be accessed in the library or by purchasing another very expensive book.

The trend is for textbooks to be published over the internet. Brown, LaMay and Burnsten's Chemistry the Central Science (http://www.prenhall.com/brown/), Zumdahl's Chemistry [The Chemistry Place (http://www.chemplace.com/)] and Atkins and Jones' Chemistry Molecules Matter and Change (http://whfreeman.com/chemistry3e/) are examples of such textbooks.

One of the age old question in a laboratory course is what to do about the laboratory portion of the course. Some schools are experimenting with the development of lab kits to use at home (9). This issue will require originality and hard work to be successful.

Students' Reactions:

Though I have no research data, I have accumulated a considerable amount of anecdotal information over the past five years of using multimedia presentation in the classroom.

The students overwhelmingly request that I use the computer presentations in the classroom. They like the handout and the time it frees them to learn and become an active participant in the learning process. They are not continually in the scribing mode but can be in the active learning mode.

There are some content areas which are not delivered using computer presentations. The students are disappointed and rejoice when the visual materials return. The students that I have in Chem I follow me to Organic Chem I and II. (I do not teach Chem II at present and they are oh so sad and try to talk me into teaching just one course for them.)

Attendance in my classes is phenomenal. Attendance use to be marginal. They like all the visual materials - the video presentations, the computer simulations, the molecular modeling etc. and they come!! This encourages me to continue this time-consuming process of making and improving the presentations and the incorporation of more animation and modeling.

So what is the catch to all this good new?
Well the catch is that this has been the most time consuming endeavor that I have ever undertaken. The creation of the modules for class is time consuming. The continual updating of information on the web-site is time consuming. The fact that you are now available to the student 24 hours a day is overwhelming.

The internet is not the most stable environment and students occasionally lose their work. If you want to see an unhappy student, just see one that entered their entire project via Lotus Notes and their system crashed before they submitted it. (We have a whole new era of excuses before us - the internet ate it!!!) Sometimes our server is down and not functioning. What do you do then? This is a entirely new environment to negotiate. However, the gratification that one sees from the increased retention rate in your classes and the enthusiasm that the students have is well worth all the stumbles along the way. I believe that as the vehicles to produce this media get better and easier to use, the task to produce and deliver this material will not be as difficult or as stressful.

The bottom line is that students come to class, they stay in class and they learn in a manner that was not available before!

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